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# COMPENDIUM

OF  
DENTAL RESIDENTS' RESEARCH PROJECTS  
AND LITERATURE REVIEWS

1989

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Joe B. Drane III, Lieutenant Colonel, USAF, DC

May 1990

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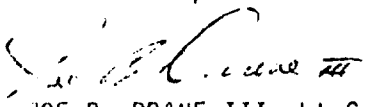
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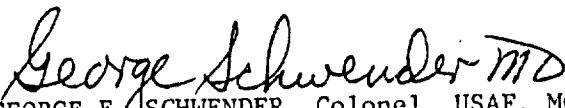
This report has been reviewed and is approved for publication.



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## PREFACE

### ABOUT THE COMPENDIUM

The Compendium of Dental Residents' Research Projects was recommended to the USAF Dental Education Committee in 1986 as a way to preserve the research efforts of U.S. Air Force dental residents.

This collection of abstracts provides a synopsis of research projects completed by graduates of United States Air Force residency programs. The projects were undertaken in partial fulfillment of the requirements of the training programs.

The opinions and assertions contained in the abstracts are those of the writers and are not to be construed as official, or as reflecting the views of the Department of the Air Force.

### USING THE COMPENDIUM

The Table of Contents contains a numbering system to aid the reader in finding titles arranged according to discipline and year of presentation. The first two digits represent the year the thesis was written. The second two digits represent the 98XX specialty discipline:

- 9826 - General dentistry
- 9836 - Oral and maxillofacial surgery
- 9846 - Periodontics
- 9856 - Prosthodontics
- 9866 - Orthodontics
- 9876 - Oral pathology
- 9886 - Endodontics
- 9896 - Pedodontics

The last two digits are for our accounting.

The Table of Contents lists the title of the thesis followed by the name of the primary author and the page number where an abstract of the thesis may be found. The names of secondary authors are listed with the abstracts.

We are providing a bibliography of Previous Titles. This section lists the titles according to the general category of their content. Within a category you'll find the titles listed alphabetically by author. If an abstract was provided in a previous edition of the Compendium, it will be in parentheses, as will be the year of publication.

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Copies of General Practice Residency (GPR) literature reviews are not kept on file, but their titles are listed here. Direct any inquiries concerning the authors of literature reviews to the address above.

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89 26 01

### EFFECTIVENESS OF THREE METHODS OF REDUCING BACTERIA ON ALGINATE IMPRESSIONS

R. Bussone, Major, USAF, DC

Surface disinfection techniques for dental alginate impression materials have been studied with respect to their effect on dimensional stability. This study examined disinfection for effectiveness in reducing bacterial contamination. Maxillary and mandibular alginate impressions were made on volunteers who had refrained from oral hygiene for 24 hours. The impressions were cut in half, resulting in four segments which were treated as follows: (1) rinsed with water 30 seconds; (2) rinsed with water for 15 seconds, followed by coating with 4% chlorhexidine gluconate soap solution for 15 seconds, followed again by rinsing with water for 15 seconds; (3) same as #2 but coated with 4% chlorhexidine gluconate soap solution for 60 seconds; (4) untreated as a control. As compared with the untreated control, alginate impressions rinsed with water alone showed a 50.8% reduction in bacterial levels; water rinse plus 15 seconds with 4% chlorhexidine gluconate soap solution resulted in a 95.6% reduction; and water rinse plus 60 seconds of 4% chlorhexidine gluconate soap solution showed a 99.8% reduction of bacterial levels.

89 26 02

### A COMPARISON OF STERILIZATION INDICATORS IN SATURATED STEAM AND UNSATURATED CHEMICAL VAPOR STERILIZERS

M. O. Coover, Major, USAF, DC

Chemical and physical sterilization monitoring devices have been developed which indicate exposure to sterilization conditions. The MDT Harvey Chemiclave is used in many dental clinics to sterilize smaller instrument packs. The effects of the Chemiclave sterilization conditions on the newer, physical/chemical indicators were unknown. This investigation was a two part laboratory study comparing the accuracy of a new physical/chemical indicator and an older process indicator (PI) against two biologic indicators of known efficacy when subjected to steam and Chemiclave sterilization. The nonbiologic indicator tested is called a physical/chemical integrator (P/CI) because it reportedly indicates exposure to heat and vapor for a specific period. Also tested was a process indicator strip. The indicators were processed through cycles of varying length and temperature to determine how closely the P/CI and PI matched the performance of the BI and SCBI, and particularly to determine whether any false negatives occur (P/CI or PI indicating sterility when the BI or SCBI does not) within the normal time/temperature operating range of the sterilizers. In the autoclave the P/CI had no false negatives while the PI gave 75% false negatives. The P/CI failed in the chemiclave.

89 26 03

# TETRACYCLINE AND CITRIC ACID ETCHING OF ROOTS OF PERIODONTALLY INVOLVED TEETH

J. P. Feeley II, Lt Colonel, USAF, DC

Previous studies have shown the effects of citric acid (CA) on the root surfaces of periodontally diseased teeth and the chemotherapeutic effects of tetracycline HCl (TCN) on bovine dentin slabs. This study compares the effects of CA and TCN on the root surfaces of periodontally involved human teeth. Periodontally diseased teeth were extracted, scaled and longitudinally sectioned. One-half of the tooth was placed in CA and the other half was placed in TCN. Varying pH values of TCN and CA were tested. Controls consisted of scaled and unscaled teeth which were not treated. The teeth were prepared for scanning electron microscopy. Results: TCN and CA removed the smear layer and exposed the dentinal tubules; CA (pH 1.18) demineralized the dentinal surface leaving exposed collagen fibrils; and TCN (pH 1.96) left a smooth surface of intact dentin. Accordingly, TCN appears to be less demineralizing in its effects and appears to cleanse root surfaces without demineralizing dentin.

89 26 04

# THE EFFECTIVENESS OF CHLORINE DIOXIDE IN THE BARRIER SYSTEM

K. K. Krause, Major, USAF, DC

The effectiveness of three immersion disinfectants: Chlorine dioxide, 2% glutaraldehyde, and 5.25% sodium hypochlorite was tested according to the Association of Official Analytical Chemists methods (as used by the EPA) against the bacteria: Staphylococcus aureus, Pseudomonas aeruginosa, and Salmonella choleraesuis. It was found that chlorine dioxide met the manufacturer's claims as a hospital grade disinfectant at a 60-sec exposure with the potential to provide an effective barrier solution for appliances in a dental laboratory setting. The 2% glutaraldehyde and 5.25% sodium hypochlorite disinfectants also met the same standards of effectiveness at 10 and 5 minutes, respectively.

89 26 05

# THE CLINICAL EFFECT OF A STANNOUS FLUORIDE CAVITY WASH ON POST-OPERATIVE THERMAL SENSITIVITY OF AMALGAM RESTORATIONS

R. M. Peterzen, Lt Colonel, USAF, DC

Topical stannous fluoride (SnF) has been previously shown to reduce sensitivity of exposed cervical root surfaces. It has also been shown to



remineralize and reduce solubility of tooth structure as well as reduce subsequent caries. The purpose of this study was to determine if an SnF cavity wash also reduces subsequent thermal sensitivity of newly placed amalgam restorations. Ten patients needing bilateral, paired amalgam restorations were treated. The teeth were tested preoperatively for vitality with ice. After preparation, one tooth was soaked with freshly prepared 8% SnF in distilled water on a cotton pellet for one minute, and the other with plain distilled water in a computer-randomized, double-blind manner. The patients were seen on post-op Days 1 and 3, and Weeks 1, 2, 4, 8, and 12. At each post-op visit the patients reported their perceived sensitivity and the sensitivity experienced when challenged with ice water. Results indicate that tooth preparations treated with SnF prior to restoration were significantly less sensitive ( $p=0.012$ , Sign Test) to perceived sensitivity as reported by the patients. Experimentally induced sensitivity resulted in a less significant reduction ( $p=0.1$ ) in the sensitivity of the SnF treated teeth. It can be concluded that the use of an 8% SnF cavity wash may reduce the thermal sensitivity perceived by patients after placement of new amalgam restorations.

89 26 06

#### APICAL LEAKAGE OF BLEACHING AGENTS THROUGH AN IRM BASE

A. DePeralta, Major, USAF, DC  
H. Joyner, Colonel, USAF, DC  
J. Burgess, Colonel, USAF, DC  
R. Davis, Major, USAF, DC

The use of intracoronary bleaching following endodontic therapy may result in percolation of the bleaching agent into the apical and/or lateral periodontal tissues resulting in possible root resorption. This study evaluated the radicular penetration of an application of Superoxol and sodium perborate, as the bleaching agent, either applied immediately after obturation or seven days after, with or without an IRM base. Forty-eight extracted human maxillary anterior teeth were randomly divided into 4 groups: (1) no base and immediate bleach, (2) base and immediate bleach, (3) no base and delayed bleach, and (4) base and delayed bleach. All bases were placed at the time of obturation; a bleaching agent containing 0.4% methylene blue dye was used as the test agent. Seven days after bleach placement the roots of the teeth were sectioned in 1-mm segments and the total distance of dye penetration was measured. A two-way ANOVA revealed that placement of an IRM base had no statistically significant effect on the apical migration of the test agent. Delaying the placement of bleach by 7 days significantly reduced the apical migration of the agent ( $p<0.035$ ). There was also no significant interaction between the effects of base and time.

89 26 07

THE EFFECT OF POLYACRYLIC ACID CONCENTRATION AND  
CONDITIONING TIME ON GLASS IONOMER ADHESION TO DENTIN

S. W. Owen, Major, USAF, DC

Polyacrylic acid dentin pretreatment has been shown to enhance glass ionomer bonding. Various concentrations and application times have been recommended. This study examined the influence of polyacrylic acid concentration and conditioning time on the shear bond strength of a glass ionomer restorative material applied to dentin. Three commercially available polyacrylic acid conditioners were evaluated: Durelon Liquid (40%), Ketac Conditioner (25%), and GC Dentin Conditioner (10%). Application times for each conditioner were 5, 10, 15, and 20 seconds. Flat dentin surfaces were prepared on the facial and lingual surfaces of extracted teeth and finished with 600 grit silicon carbide paper. Ketac-Fil glass ionomer cylinders were bonded to the conditioned dentin surfaces. The control group received no conditioning prior to bonding. Shear bond strengths were determined using an Instron with crosshead speed of 0.5 mm/minute. The data was analyzed statistically with a two-factor ANOVA and post-hoc Dunnett's t-test at the 5% level of significance. The shear bond failure mode of the glass ionomer was examined and classified using scanning electron microscopy and stereo microscope. The results showed that none of the groups conditioned with polyacrylic acid had shear bond strengths significantly stronger than the unconditioned control group. All shear bond fractures were cohesive failures of the glass ionomer restorative material.

89 26 08

THE SHEAR BOND STRENGTH OF COMPOSITE RESIN BONDED TO ACID  
ETCHED ENAMEL CLEANED WITH A FLUORIDE PROPHYLAXIS PASTE

E. S. Schuermer, Major, USAF, DC

This in-vitro study evaluated the shear bond strength of resin to enamel after the enamel had been prepared with pumice/water and three fluoride-containing prophylaxis pastes. The facial enamel surfaces of 48 maxillary anterior teeth were disked and equally divided into four groups. The four prophylaxis pastes were applied and the facial surfaces were washed and etched with 37% phosphoric acid gel. Scotchbond II bonding agent and Valux composite resin were then applied, light cured, and loaded in shear until fracture. The shear bond strengths of pumice/water, 1.23% APF (Nu-pro), and 1.64% stannous fluoride groups were not statistically different, whereas the pumice/water and sodium fluoride (Uni-pro) groups did reveal a statistical difference. Evaluation of the fracture sites demonstrated that a majority of the fractures were enamel cohesive or composite cohesive. The results support the observation that fluoride-containing prophylaxis pastes applied prior to acid etching do not weaken or concentrate the fracture failures at the enamel-resin interface.

89 26 09

#### IN-VIVO AND IN-VITRO COMPARISON OF DENTIN BONDING AGENTS

S. Gray, Major, USAF, DC  
J. Burgess, Colonel, USAF, DC

This study compared the shear bond strength of 2 dentin bonding agents, in vivo and in vitro, using a prepared goat dentin model. Under general anesthesia, the mandibular incisors of 10 adult goats were prepared to a flat surface. Two areas of dentin (one incisal and one gingival) were isolated with Teflon tape, exposing a 2.83 mm area of dentin. Then GLUMA or Scotchbond II was applied. A column of resin was placed and light-cured over the Teflon tape opening using Valux with Scotchbond II and LUMIFOR with the GLUMA system. Two hours later, the animal was sacrificed and the teeth surgically removed. The specimens were mounted in acrylic and the composite resin loaded under shear force until failure using an Instron. Seven days later, the dentin was reprepared and the bonding procedure repeated. Two hours later the bonds were broken. Thirteen months later, those specimens bonded exclusively with GLUMA and LUMIFOR were prepared as before using GLUMA and LUMIFOR and the composite resin loaded under shear force until failure. Analysis was done using an ANOVA to the  $p=0.05$  (sic) level. Statistically, there was no significant difference between a 2-hour bond strength obtained in vivo versus in vitro, or between the 7 day post-extraction bond strength and the 13 month bond strength. Bond strengths of resin bonded to the incisal half were significantly stronger than those bonded to the gingival half. Finally, the efficacy of GLUMA and Scotchbond II were not significantly different.

89 26 10

#### EVALUATION OF CHEMICAL ETCHING SYSTEMS FOR A BASE METAL ALLOY

D. Sedberry, Captain, USAF, DC  
J. Burgess, Colonel, USAF, DC  
R. Schwartz, DDS

This study compared the tensile bond strength of Rexillum III disks etched by three chemical etching systems and cemented together with composite cement to that obtained with the electrochemical etching technique. Cast Rexillum III disks were etched using the following etching systems: Electrochemical (EL), Assure-Etch (AE), Met-Etch gel (ME), and ETCH-IT gel (ET). The etched disks were luted in pairs with a composite cement using a constant weight. Four groups of 30 cemented specimens were prepared. One-half of the samples from each group were thermocycled from 5-60°C for 600 cycles. Samples were loaded to failure in tension on an Instron testing machine using a crosshead speed of 5 mm/min. The resulting mean tensile strengths (Newtons) and standard deviations were: EL=522 (124), AE=391 (83), ME=374 (109), and EI=304 (120). A 2-way ANOVA revealed no significant difference between bond strengths of thermocycled and nonthermocycled samples; accordingly, the data for both

groups were pooled. A Tukey B post-hoc analysis indicated that samples etched electrochemically yielded significantly ( $p < .05$ ) greater bond strengths than those etched chemically. The rank order of groups was: EL > AE = ME > ET. Scanning electron microscopy evaluation of etch patterns supported the results of bond strength determinations.

89 26 11

#### WET AND DRY FINISHING OF DENTAL COMPOSITE RESIN

R. M. Greiff, Major, USAF, DC

This study compared the surface smoothness of 60 composite resin restorations polished with three different polishing instrument series under both wet and dry conditions. Groups of 20 restorations, 10 wet and 10 dry each, were finished and polished using the following regimen: 1. Sequential high-speed 12 fluted burs followed by 30 fluted carbide burs, followed by 1.0 then 0.1  $\mu$ m aluminum oxide finishing pastes. 2. Slow-speed 45, followed by 25, then 10  $\mu$ m diamond burs. 3. Slow-speed alumina oxide disks. Profile roughness was measured for each polished sample as well as its individual control. No significant difference was found between wet and dry polishing. At the 0.25-mm cutoff the Soflex yielded the smoothest polish, while the carbide burs were intermediate, and the diamond burs were roughest. At the 0.08-mm cutoff both Soflex and carbide polishing were not significantly different; however, diamond polishing yielded significantly rougher results. In a visual-ranking analysis of 63-X micrographs carbide bur/Luster paste polish exceeded Sof-Lex disk polish in smoothness, which, in turn, exceeded diamond bur polish.

89 26 12

#### CUTTING EFFECTIVENESS OF DIAMOND INSTRUMENTS SUBJECTED TO CYCLIC STERILIZATION METHODS

K. M. Gureckis, Lt Colonel, USAF, DC

J. O. Burgess, Colonel, USAF, DC

R. S. Schwartz, Colonel, USAF, DC

The effect of repeated sterilization on the cutting effectiveness of one brand of rotary dental diamond cutting instruments was measured. Four groups of ten diamond burs were sterilized by four different methods: sterilization with a chemical agent (Sporicidin), steam under pressure (Autoclave), dry heat (Dry-Clave), or chemical vapor (Chemiclave). Each group of diamond instruments made a timed cut in a ceramic block. This cut and all subsequent cuts were measured and used to determine a baseline cutting effectiveness. Each group was then ultrasonically cleaned and sterilized, and another cut made. At the end of ten cycles there was no difference in cutting efficiency of the dental diamond instruments; no means of sterilization was better or worse than another. However, there are differences in the cutting efficiency of individual diamond

instruments. The scanning electron microscopy evaluation made prior to cutting and at the end of the ten cycles of sterilization, demonstrated that diamond wear was similar in all groups and little diamond particle loss occurred in any group.

89 26 13

# EFFECTIVENESS OF WARMED DISINFECTANTS WITH "BARRIER SYSTEM" AT DECREASED TIMES

T. J. Kinyon, Major, USAF, DC  
R. S. Schwartz, Colonel, USAF, DC  
J. O. Burgess, Colonel, USAF, DC

The "Barrier System" is an infection control protocol which minimizes cross-contamination of dental prostheses by disinfecting them as they enter and leave the laboratory. Previous studies have evaluated the effectiveness of various disinfectant solutions used with the "Barrier System" for 1 to 10 minutes at room temperature. This study evaluated 3 disinfectants with 1 or 2 minute working times at 37°C using the "Barrier System" protocol. Using five disinfecting solutions, 100 functioning removable prostheses were cultured before entering the laboratory and after each step of the "Barrier System" protocol. Positive cultures after five days incubation are listed below.

<u>Solutions</u>	<u>Time</u>	<u>Temp</u>	<u>Initial Culture</u>	<u>After 1st Culture</u>	<u>After 2nd Culture</u>
Sporicidin (Control)	10 min	24°C	20	0	0
Sodium Hypochlorite	1 min	37°C	20	0	0
Alcide Expore	2 min	37°C	20	1	0
Tetravalent Oxident	1 min	37°C	19	2	1
Tetravalent Oxident	1 min	24°C	20	10	5

Test results were analyzed using chi square. The first four solutions were highly effective as disinfectants for dental prostheses. Tetravalent oxident at 24°C was significantly less effective ( $p < .001$ ) than the other disinfectants. There were no other differences.

89 46 01

# SALIVARY IgA AND IgA SUBCLASS RESPONSES TO BACTEROIDES GINGIVALIS IN THE CYNOMOLGUS MONKEY

S. B. Blanchard, Major, USAF, DC

Ligature-induced periodontitis in the cynomolgus monkey has been proposed as a model for studying human periodontitis. Periodontal breakdown in this animal is associated with an increase in B. gingivalis in the subgingival microflora. The predominant immunoglobulin of external secretions is IgA; it

has been found to exist as 2 subclasses, IgA1 and IgA2. It has also been found to protect against infection by reducing bacterial colonization of mucosal surfaces. This study was conducted to measure the naturally-existing salivary IgA and IgA subclass levels as well as IgA and IgA subclass antibodies to B. gingivalis in a group of cynomolgus monkeys. Whole and parotid saliva was collected biweekly over a 2-month period. The IgA and IgA subclass responses as well as antibodies to B. gingivalis were quantitated by the use of ELISAs. Results showed that IgA levels were 20% greater in whole saliva compared to parotid secretions. It was found that this IgA consisted of 58% IgA1 and 42% IgA2. Naturally-occurring IgA antibodies to B. gingivalis were routinely detected, although low in whole saliva; the presence of the antibodies was negligible in the parotid saliva of most animals. Of this IgA antibody to B. gingivalis, there was a tendency towards greater IgA2 antibodies compared to IgA1 antibodies; however, this tendency did not reach statistical significance for the entire group of animals. These results should facilitate future immunization experiments examining the interactions of salivary IgA with the emergence and transmission of B. gingivalis within the oral cavity.

89 46 02

#### CLINICAL AND HISTOLOGICAL EVALUATIONS OF HARD TISSUE REPLACEMENT ALLOPLASTIC GRAFTING MATERIAL, CASE REPORTS

J. Y. Kwan, Major, USAF, DC  
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The Hard Tissue Replacement (HTR) polymer is a nonresorbable calcium-layered polymer of polyhydroxyethylmethacrylate (PHEMA) and polymethylmethacrylate (PMMA), which is treated with barium to promote radiopacity; it is used as an alloplastic periodontal and oral surgical grafting material. The case reports present clinical and histological findings related to the use of HTR polymer as a periodontal grafting material and as an alveolar bone maintenance material in an extraction site. In the case of its use as a periodontal grafting material, a few fragments of foreign material consistent with implant material were seen which were associated with a minimal chronic inflammatory reaction. In the deeper lamina propria there were fragments of a granular foreign material. These fragments were associated with fibrosis and a mild histiocytic reaction (multinucleated histiocytes or giant cells were noted). The second case in which HTR was used to maintain the alveolus post extraction was examined 10 months after placement. Within the fibrous tissue were areas of looser granulation tissue containing numerous plasma cells, neutrophils, and lymphocytes. In some, but not all, of these granulation tissue areas, there were refractile fine particles of implant material within histiocytes. Larger intact implant particles were bordered by histiocytes and/or fibrous tissue. The two cases reported demonstrated post-surgical clinical and radiographic courses well within normal limits. However, histologically, the presentation was less than ideal.

# EIGHT-WEEK HISTOLOGIC STUDY OF MODIFICATIONS OF THE CORE-VENT IMPLANT SYSTEM

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The Core-Vent implant system is a self-tapping, Titanium (Ti) alloy implant with a vented hollow basket at the apical half. The osteotomy is prepared with size specific drills, such that an intact core of bone will be left in the hollow basket as the implant is tapped into place. The purpose of this research was to study the 8-week healing of 4 modifications of the system: (1) PLACEMENT W/O A CORONAL HEALING CAP (8 OF 16); (2) IMPLANT PLACEMENT W/O A BONE CORE (10 OF 16); (3) IMPLANT PLACEMENT W/ A BROKEN BONE CORE (6 OF 16); and (4) 5  $\mu$ m ION SPUTTER COATING HYDROXYLAPATITE (8 OF 16). Sixteen implants were placed in the edentulous mandibles of an animal model (4 mongrel dogs). After an 8-week healing period, the specimens were prepared for histological evaluations. (1) The soft tissue response to healing w/o a healing cap was associated w/ a loose cellular layer exhibiting inflammatory cells in 5 of 8 sections and in 1 of 8 w/ a healing cap which was not flush in placement. No obvious associated bone healing differences were noted on XR or histo. (2) All implants placed w/o a bone core revealed bone formation in the basket and vents. (3) Of the implants placed w/ a broken bone core, five of six exhibited bone in the vents, and three of six exhibited continuous bone between the broken core thru the vents to surrounding bone. (4) The relative percentage of bone-implant contact calculated for 2 sections/implant, was 54.03% (SD 20.39, + 5.18) for ion sputter coated vs 42.29% (SD 19.41, + 5.09) for Ti alloy ( $P < 0.10$ ). Areas were consistently noted where the coating was thinner, absent or separated.

# LONGITUDINAL ASSESSMENT OF DISEASE SITES BY ATTACHMENT LEVEL CHANGES AND BONE DENSITY LOSS AS MEASURED BY DIGITAL IMAGE ANALYSIS

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This study attempted to evaluate quantitative changes in radiographic density as a potential indicator of disease progression. Standardized radiographs of 21 subjects with a history of periodontitis were monitored at baseline and at 3, 6, and 9 months using duplicate probing attachment level (PAL) measurements and computer assisted densitometric image analysis (CADIA). Radiographs were taken using a cephalostat and film holders modified with occlusal registrations. The PAL measurements were recorded to the nearest millimeter from interproximal sites using stents as attachment level

references. Results indicate that the majority of sites exhibited no PAL change during the 9-month period; however, the percentage of sites with loss increased with time. At nine months, subjects who had undergone periodontal therapy with no maintenance care (T/NM) exhibited attachment loss similar to untreated (UT) subjects, while treated/maintained (T/M) subjects exhibited less attachment loss. For UT and T/NM subjects, proportionally more attachment loss was seen at sites with initial probing depths greater than 3 mm, while in T/M subjects more attachment loss was seen at sites initially probing 3 mm or less. Due to the 2 dimensional nature of radiographs, density analysis was calculated in terms of radiographic "complexes" of multiple probing sites. At 9 months there was significantly more density loss at complexes with 2 mm of attachment loss than at sites with no change; there was no such difference noted at 3 and 6 months. Also, density loss tended to increase as more sites within each complex experienced attachment loss. It was concluded that a significant correlation existed between mean density and PAL changes during the same time interval; however, there were wide variations at individual sites. This study found little value of monitoring density change to predict future episodes of PAL loss.

89 56 01

#### TWO KINEMATIC METHODS FOR LOCATING THE TRANSVERSE HORIZONTAL AXIS OF THE MANDIBLE

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This study compared the speed and accuracy of two nonconventional methods for the kinematic location of the transverse horizontal axis of the mandible. Posterior reference points (PRPs) were located on 10 subjects using bimanual manipulation and a conventional kinematic face-bow (CKFB). Next, PRPs were estimated as described by Gunderson and Parker (GP) using the intersection of perpendiculars to midtangents of concentric arcs recorded anterior and inferior to the temporomandibular joint (TMJ) area. Then, the Universal hinge axis recorder (UHAR), a wire face-bow with dotted flags, was used to find PRPs. All methods used the same flag assembly and were timed from the start of mandibular arcing to PRP location; previous graphic records were hidden for each subsequent procedure. Mean completion times (min) were: CKFB = 4.1 (SD+1.7), and UHAR = 1.5 (SD+1.2). A significant difference was found ( $p < .01$ , ANOVA and Scheffe's tests) between completion times for the UHAR procedure and the other methods. The mean distances (mm) from the conventional PRP were 3.3 (SD+1.7) for GP and 2.6 (SD+1.3) for UHAR. No significant difference was found between distance measurements of the two methods ( $p > .01$ , Student's  $t$  test). The data suggest that the UHAR method is quicker and may be as accurate as the conventional method.



# EFFECTS OF COLD SOLUTION IMMERSION DISINFECTION AND ETHYLENE OXIDE STERILIZATION ON THE LINEAR DIMENSIONAL STABILITY OF DENTAL CASTS

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The purpose of this study was to compare to a control the measured effects on dimensional stability of Type IV dental stone (improved dental stone) casts immersed in either sporicidin disinfectant solution or Omni II disinfectant solution, or those sterilized in an ethylene oxide gas unit. Sporicidin is a glutaraldehyde alkaline with phenolic buffers that is mixed 1:16 with water; Omni II is a 9% o-phenylphenol, 1% o-benzyl-p chlorophenol that is mixed 1:32 with water. In this study both of these disinfectant solutions were diluted with distilled slurry water to minimize any effects of the water on the casts. The Amsco ethylene oxide gas sterilization unit was used according to manufacturer's directions. Twenty polysulfide rubber base impressions were taken of an edentulous aluminum master model (preindexed at several locations) and were poured in Type IV stone. Pretreatment measurements of the twenty casts were taken between the three preindexed locations after 24 hours, using the Unitron Universal Measuring Microscope.

The four groups of five casts were: (1) untreated controls; (2) immersed in Sporicidin disinfectant solution (10 minutes); (3) immersed in Omni II disinfectant solution (10 minutes), and (4) sterilized in an ethylene oxide gas unit. The treated casts were either immersed in disinfectants or treated with the ethylene oxide unit after 24 hours as recommended by the manufacturer.

Forty-eight hours after initial pouring of the casts posttreatment measurements were taken on all casts using the Unitron Universal Measuring Microscope between the three preindexed distances. The Pretreatment/posttreatment dimensional stability between the three preindexed distances A-B, B-C, A-C, and total combined distance (A-B+, B-C+, A-C) of the 4 groups of casts were tested by the ANOVA: two factor mixed design (repeated measures on one factor), F test.

The results of this study found no statistically significant effects of cold solution disinfection or ethylene oxide sterilization on the dimensional stability of Type IV dental casts.

## SURFACE MODIFICATION OF ORTHODONTIC BRACKET MODELS VIA ION IMPLANTATION: EFFECT ON COEFFICIENTS OF FRICTION

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In an effort to reduce the unwanted effects of friction, ion implantation of bracket models was accomplished and tested against the four major orthodon-

tic alloy groups, [stainless steel (S.S.), cobalt-chromium (Co-Cr), nickel-titanium (NiTi), and beta-titanium (B-Ti)]. Stainless steel right-hand cylinders, 1/4" x 1/2", were used to simulate orthodontic brackets. In addition to control samples, the polished faces of these cylinders were implanted with N+, Ti+/N+, N+/Cr+, N+/Ti+, Ti+/Cr+, Ti+/Ti+, and Cr+. All were implanted at  $2 \times 10^{17}$  /cm<sup>2</sup> except Ti+ ( $4 \times 10^{17}$  /cm<sup>2</sup>) and Cr+ ( $3 \times 10^{17}$  /cm<sup>2</sup>). Quality control was insured using Auger spectroscopy, specular reflectometry, and microhardness tests. Using an Instron tester, the two cylinder flats were drawn along each arch wire at 1 cm/min at 34°C in saliva. Frictional forces were measured, and both the coefficient of static friction,  $\mu_s$ , and the coefficient of kinetic (sliding) friction,  $\mu_k$ , were determined while varying the normal forces from 0.2 to 1.0 kg.

The kinetic coefficients of the arch wires against the control S.S. models measured 0.163, 0.143, 0.240, and 0.312, respectively ( $P < 0.01$ ). Results reveal that, with few exceptions, the S.S. control cylinders yielded lower  $\mu_k$ 's than the implanted cylinders. Any improvement seen with the implantations was marginal at best.

89 66 02

#### THE OPEN-BITE BIONATOR: A CEPHALOMETRIC ANALYSIS OF TREATMENT EFFECTS

J. R. Weinbach, Major, USAF, DC

A sample of 39 cases (27 males and 12 females) was analyzed using pre- and posttreatment cephalometric radiographs to evaluate skeletal and dental changes that occurred following treatment with the Open-Bite Bionator. The ages of the patients at the beginning of treatment ranged from 7 years, 1 month to 12 years, 11 months. Average treatment time was 20.5 months. All radiographs were digitized and analyzed using an IBM AT computer and Numonics 2400 digitizer. The results showed that this appliance is selected by clinicians for those patients showing the typical open-bite, long-face skeletal and dental patterns. Statistical analyses showed no treatment differences based on sex, or the use of headgear in conjunction with the Bionator therapy. However, many important cephalometric variables were influenced by the Bionator treatment when compared to changes expected by growth alone. The primary effects noted were: (1) substantial decrease in overjet; (2) decrease in skeletal facial convexity; (3) reduction of skeletal maxillary protrusion and/or mandibular retrognathism; (4) improvement of several soft-tissue parameters; and (5) restriction of maxillary posterior vertical growth. Seven of the measurements were shown to change in the direction opposite that of normal growth. Only weak relationships were demonstrated between treatment results and age at start of treatment, length of treatment, and initial cephalometric values. The results described in this study indicate that the Open-Bite Bionator provides an excellent treatment modality for growing patients in correcting a most challenging malocclusion.

89 86 01

THE EFFECT OF PREFLARING ON CANAL TRANSPORTATION: EVALUATION  
OF ULTRASONIC, SONIC, AND CONVENTIONAL TECHNIQUES

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S. Montgomery, DDS

This study evaluated the effect on canal transportation when preflaring canals with Peesco reamers prior to using Cavi-Endo, MM-3000, and hand instrumentation techniques. Twenty resin blocks with simulated curved root canals were instrumented with each technique to a size 40 file 0.5 mm from the apical foramen. Ten of the canals were preflared in the coronal region with #1 and #2 Peesco reamers prior to instrumentation, and 10 that were not preflared served as controls. Transportation was measured on the inside canal curvature 3 mm from the canal orifice and 8 mm coronal to the working length, and on the outside canal curvature 1 mm coronal to the working length. A statistical analysis using Student's t test did not show a significant reduction in canal transportation for the preflared groups. In some areas the amount of transportation was less for the preflared groups, and in other areas it was greater.

89 86 02

THE EFFECTIVENESS OF ULTRASONICS AND CALCIUM HYDROXIDE  
FOR THE DEBRIDEMENT OF HUMAN MANDIBULAR MOLARS

R. S. Metzler, Major, USAF, DC

The ability of ultrasonics and calcium hydroxide to remove pulp tissue debris from the mesial root canals of human mandibular molars was evaluated using an in-vitro model. All canals were instrumented using a standard filing technique and irrigated with equal volumes of 2.6% sodium hypochlorite before the application of the experimental debridement methods. The three experimental groups consisted of the application of ultrasonic debridement using the Cavi Endo insert, using a one-week application of calcium hydroxide as an intracanal medicament, and using a combination of both. Debridement comparisons were made to both instrumented and uninstrumented controls at the 3-mm and 1-mm levels of the canals and isthmuses using an Image Analysis program. Statistical analysis showed no differences among the experimental groups or the instrumented controls in the canals at either level or isthmuses at the 3-mm level. In the isthmuses at the 1-mm level, no differences were found among the experimental groups, but they were all significantly cleaner than the instrumented controls. These results indicate that calcium hydroxide and ultrasonics are equally effective in debriding the root canal system, and that both are significantly better than standard instrumentation alone. Therefore, it is recommended that post instrumentation ultrasonic debridement be used in treating those teeth completed at one appointment, and that calcium hydroxide be placed into the canals between appointments for treating those teeth to be completed in two or more appointments.

NEOPLASTIC DISEASES IN A PEDIATRIC POPULATION: A SURVEY  
OF THE INCIDENCE OF ORAL COMPLICATIONS

A. A. Kamp, Major, USAF, DC

A survey of 186 pediatric patients with neoplastic disease at Riley Children's Hospital in Indianapolis, Indiana was conducted to determine the distribution, frequency, and types of oral problems encountered during their hospitalization. Thirty-one per cent of the patients had some form of oral complications during the course of their hospitalization. Ten percent of the patients had existing dental treatment needs prior to cancer treatment. The oral problems most frequently seen were mucositis, fungal or candidal infections, gingival bleeding, herpetic lesions, and aphthous ulcerations. Different frequencies of oral complications existed between differing types of malignancy and types of therapy. Not all patients receiving chemotherapy developed oral complications. The hospital dentist should therefore recognize the different clinical and biological characteristics of each neoplastic disease, and should review the various options and phases of treatment in assessing patients.

GENERAL PRACTICE RESIDENTS'  
ARTICLES/LITERATURE REVIEWS: 1989

1. Bolling Air Force Base, DC.

Det 1, Malcolm Grow USAF Medical Center/Maj Douglas P. Rockwood, Interim Director.

- a. "Porcelain Repair Systems," Jul 89, Jose M. Arango, Capt, USAF, DC.
- b. "Gingival Hyperplasia Secondary to Systemic Medications," Jul 89, Mary E. Colosimo, Capt, USAF, DC.
- c. "The Stressed Dental Pulp," Jul 89, Karen A. Knight, Capt, USAF, DC.
- d. "Dentinal Hypersensitivity: A Survey of Current Methods of Treatment," Jul 89, David L. Turner, Capt, USAF, DC.

2. Chanute Air Force Base, IL.

USAF Hospital Chanute/Lt Col William P. Caldon, Director.

- a. "Cosmetic Dentistry: Posterior Porcelain Resin-Bonded and Castable Ceramic Restorations," Jul 89, Tamara E. Bloch, Capt, USAF, DC.
- b. "Extracoronary Bleaching," Jul 89, Johnny S. Han, Capt, USAF, DC.
- c. "Ceramic Implants in Periodontal Therapy," Jul 89, Ronald K. Risinger, Capt, USAF, DC.
- d. "External Resorption: A Review," Jul 89, Mark A. Slabbekoorn, Capt, USAF, DC.

3. Scott Air Force Base, IL.

USAF Medical Center Scott/Col William D. Theobald, Director.

- a. "Review of Diabetes Mellitus," Jul 89 Bret A. Avra, Capt, USAF, DC.
- b. "Osseointegrated Implantology: A Review of its Principles, Effectiveness, and Application in Restorative Dentistry," Jul 89, David F. Fishbaugh, Capt, USAF, DC.
- c. "Oro-antral Communications: An Overview of Prevention, Diagnosis, and Surgical Closure Technique," Jul 89, Michael J. Knott, Capt, USAF, DC.
- d. "Glass Ionomer Cement: A Literature Review and Current Clinical Concepts," Jul 89, Daniel A. Williams, Jr., Capt, USAF, DC.

4. Sheppard Air Force Base, TX.

USAF Regional Hospital Sheppard/ Lt Col Kevin M. Gureckis, Director.

a. "Interrelationships Between Orthodontics and Periodontics in the Adult Population," May 1989, Julie M. Collins, Capt, USAF, DC.

b. "The Etiology and Management of Cleft Lip and Palate in Children," May 1989, David K. Andrews, Capt, USAF, DC.

c. "Dental Treatment of the Pregnant Patient," May 1989, Thomas M. Martin, Capt, USAF, DC.

d. "Xerostomia: Diagnosis, Etiology, and Treatment Considerations," May 1989, Richard W. Zapfe, Capt, USAF, DC.

5. Travis Air Force Base, CA.

David Grant USAF Medical Center/Col Stanley M. Plies, Director.

a. "Topical Antiplatelet Agents: A Literature Review," Jul 89, Keven F. Hughes, Capt, USAF, DC.

b. "A Review of Properties and Techniques that Affect the Accuracy of Frequently Used Impression Materials," Jul 89, Wayne S. H. Leong, Capt, USAF, DC.

c. "Periodontal Disease in Children: A Review of Literature," Jul 89, Jean M. Schultz, Capt, USAF, DC.

d. "Chloral Hydrate Sedation for the Pediatric Dental Patient: A Literature Review," Jul 89, Jeffrey S. Thompson, Capt, USAF, DC.

6. Wright-Patterson Air Force Base, OH.

USAF Medical Center Wright-Patterson/Lt Col William C. Langenderfer, Director.

a. "Treatment of Patients with Osteoradionecrosis: An Overview of Hyperbaric Oxygen Therapy and a Case Report," Jul 1989, J. Mark Domin, Capt, USAF, DC.

b. "A Case of Diffuse Sclerosing Osteomyelitis or Disappearing Bone Disease," Jul 89, Brian Holt, Capt, USAF, DC.

c. "Formocresol and Dentistry: Is Continued Use Justified," Jul 89, Constance Huff, Capt, USAF, DC.

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